market in one form or another, that it is considerably freer from microbes than ordinary butter when the latter is not made with Pasteurised cream. Whereas butter contains an average of from 10 to 20 millions of microbes per grm., margarine-butter yields but from 4 to 6 millions; moreover, whilst in extreme cases as many as 47 millions of microbes have been found per grm. in butter, margarine can only boast of at most something over 11 millions. Cold appears to act more prejudicially on margarine microbes than it does on butter germs; thus in one case a reduction from 6½ millions to 230,200 per grm. was observed in margarine, whilst a similar exposure never succeeds in eliminating more than one-third of those present in butter, according to Lafar. It is reassuring to learn that in none of the numerous samples examined were pathogenic bacteria discovered; many of the ordinary microbes present were isolated and described, and amongst these two were found which the authors believe are closely associated with rancid processes which occur in old samples of margarine. To further reduce the microbial population of margarine butter, it is suggested that only sterile milk and sterile water should be used in its manufacture from oleo-margarine, which is considerably poorer in bacterial life than the finished product.

IN the years 1891 and 1892, the Norwegian Government fitted out a vessel for the purpose of making temperature observations round the Lofoden Islands, with the view of tracing the connection between the habits of the cod and the temperature of the water, and the Parliament voted a sum of money for the purchase of thermometers for registering the temperature at various depths. We have received from Lieutenant G. Gade, who was entrusted with the investigation, a pamphlet entitled "Temperaturmaalinger i Lofoten," which contains an interesting account of the results obtained. He found that at the same places the temperature sometimes increased regularly according to the depth, while at others there were two distinct strata of water, the cold being uppermost. Although the vertical variations of temperature may have been considerable, yet he always found an increase with depth. The favourite temperature of the cod is supposed to be 5° C., and while in January 1892 this was found at the surface, in March 1891 it was only found at a depth of 160 metres; the greatest depth at which fishing takes place is 200 metres, where 6°–7° C. were recorded nearly constantly from January to the middle of April. Lieutenant Gade found that when there were two strata of water, one cold (2°–3° C.) uppermost, and one warmer (5°–7° C.) below, the cod was always found in the warmer stratum; but, as the fishing takes place at depths where the temperature is from 4°–7° C. or more (and the depths where these temperatures are found are very different), the author considers that the fisherman cannot derive practical advantage from temperature observations alone.

CHORISIS, or the doubling of the parts, is by no means a rare occurrence in flowers. In this phenomenon there appear, apparently in the place of one floral leaf, especially a stamen, two such leaves either collaterally, *i.e.* beside one another, or serially, above one another. These pairs of leaves may arise either out of a single common primordium, or directly from the axis. Up to the publication of a paper on "Das Reductionsgesetz der Blüthen," by Dr. Lad. J. Čelakovský (Stzb. der königl. böhmischan Ges. der Wissenschaften), morphologists agreed in regarding chorisis as the division or branching of an originally simple leaf. Dr. Čelakovský, however, comes to the following conclusions, amongst others, after a very complete consideration of a large number of instances. Normal chorisis occurs not as a division of a single leaf, but rather as a fusion, or at least an approximation of distinct and originally uniformly separated leaves. In the ontogeny of the plant this may occur as a branching or positive chorisis, as he terms it, of a single primordium, but this fact does not afford, according to him, a clue to the steps in the phylogenetic development, by which the present state has come about; but he believes, in opposition to the hitherto received opinion, that the present condition in these flowers was attained by negative chorisis or approximation. Normal chorisis is the expression of an incomplete transition from a state in which the individual leaves composing a whorl or whorls were more numerous, into one in which they are less numerous. It is, in fact, the resultant of two tendencies—one, the older, to polymerism, and the other and newer, to oligomerism. The reduction so effected is always governed by the law of the alternation of the consecutive leaf-whorls. Dr. Čelakovský's paper is one of great interest, and the discussion as to the origin of the various types of andrœcium will no doubt be specially useful to those who are interested in the affinities of the natural orders of dicotyledons and monocotyledons.

THE publishers of *Knowledge* announce that Dr. Isaac Roberts, F.R.S., will shortly continue in that magazine his selection of photographs of stars, star-clusters, and nebulæ. The series is intended to be in continuation of Dr. Roberts's work, "A Selection of Photographs of Stars, Star-Clusters, and Nebulæ," recently published, and which has contributed very largely to the extension of the knowledge of astronomical phenomena.

THE July number of *Natural Science* is devoted to brief descriptions of the results of the *Challenger* Expedition, from the points of view of investigations in many branches of knowledge. Each of the contributors, all of whom write with authority upon their respective subjects, more or less confines himself to answering the question, "How has the *Challenger* Expedition advanced science?" The brief summaries thus obtained form a very valuable and compact index to the advances in various fields of natural knowledge due to the Expedition.

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus sinicus*, ♀) from India, presented by Mr. John Norbury, Junr.; a Macaque Monkey (*Macacus cynomolgus*, ♂) from India, presented by Mr. H. W. Ball; a Black-eared Marmoset (*Hapale pencillata*) from South-east Brazil, presented by Mr. H. P. Roberts; a Rough Fox (*Canis rudis*) from British Guiana, presented by Dr. Irvine K. Reid; a Grey Ichneumon (*Herpestes griseus*) from India, presented by Lady Champion de Crespigny; seven Black Salamanders (*Salamandra atra*), a Slowworm (*Anguis fragilis*) from Switzerland, presented by the Rev J. W. Horsley; a Burchell's Zebra (*Equus burchelli*, ♂) from South Africa, a Common Rhea (*Rhea americana*) from South America, deposited; two Black-necked Swans (*Cygnus nigricollis*) from Antarctic America, three Blue Snow Geese (*Chen cærulescens*) from Alaska, purchased; a Thar (*Capra jemlaica*, ♀), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

VARIABLE STARS.—Dr. Chandler has completed a revised supplement to his well-known second catalogue of variable stars; together they furnish a complete list of known variables, comprising in all 344 stars. Some little difficulty has been experienced in connection with the southern variables, on account of the want of accurate positions and certain identifications in some cases. Dr. Chandler especially shows a want of confidence in the data relating to the variables discovered photographically at the Boyden station of the Harvard College Observatory at Arequipa,; but considering the pressing need of a definitive nomenclature, and relying on the assurances of Prof. Pickering, most of these objects have been included in the catalogue and letters assigned to them.

All the recent observations made by the South African ob-

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server, Mr. Roberts, have also been included in the new catalogue. (*Astronomical Journal*, No. 347.)

The Temperature of the Sun.—A new method of determining the temperature of the sun has been employed by H. Ebert (*Astrophysical Journal*, June). With the aid of data supplied by Langley's investigations, Rubens deduced the law that the wave-length of the maximum energy is inversely proportional to the square root of the absolute temperature of the radiating body. Experiments on the radiation of blackened bodies between absolute temperatures 373° and 1088° indicated the relation

$$\lambda\sqrt{T} = 123,$$

T being the absolute temperature, and λ being expressed in microns ($\mu = {\cdot}001$ mm.). Langley has shown that the maximum energy of the continuous background of the solar spectrum is very nearly at 0·6 μ, and assuming that the incandescent particles in the sun which yield the continuous spectrum are comparable to a black body as regards their total radiating capacity, the application of the above formula gives a temperature of about 40,000° C. The parts of the sun to which this temperature applies are stated to belong to the interior regions, below the photosphere.

Dr. Ebert enters into a discussion of the electromagnetic nature of the solar radiation, in order to justify the application of the formula in the case of the sun. This leads him incidentally to suppose that the continuous background of the solar spectrum is mainly due to hydrogen in a strongly compressed state.

The Rotation of Saturn.—In 1893 Mr. Stanley Williams announced some highly interesting facts with reference to the period of rotation of Saturn, as deduced from observations of spots on different parts of the surface of the planet (Nature, vol. l. p. 32). The observations were continued during the opposition of 1894, and similar striking results have been arrived at. (*Monthly Notices*, vol. lv. p. 354). It was again found that the spots indicated widely different rotation periods in the same latitude, but in different longitudes, as shown in the following table:—

	Range in longitude.	Mean period. h.	m.	s.
Dark spots (17°–37° N.)	30°–130°	10	14	57·29
	140–200		14	44·23
	240–360		15	47·97
Bright spots (6° S.–6° N.)	0–80		13	1·69
	80–160		12	40·03
	160–360	10	12	25·83

The average rotation periods of the whole equatorial spot zone during the four years of observation were as follows:—

	h.	m.	s.		s.
1891	10	14	21·8	Diff.	43·6
1892		13	38·2	”	45·8
1893		12	52·4	”	16·6
1894	10	12	35·8		

The extreme difference of 1m. 46s. observed since 1891 "means a very considerable increase in the velocity of motion of the surface material, amounting to 66 miles per hour. In other words, the great equatorial atmospheric current of Saturn was flowing 66 miles an hour more quickly in 1894 than it was in 1891."

Taken as a whole, the observations indicate a more rapid rotation of the planet in the equatorial regions than in the northern zone of spots, and they appear to establish that there are great differences of velocity in different longitudes.

To Prof. Darwin, these results "suggest a rather wild consideration" (*Observatory*, June). He considers it possible that sections of the planet parallel to the equator may not be circular, and suggests that it might be worth trying to detect systematic differences between the various equatorial diameters by micrometric measurements.

THE VISIBILITY OF SHIPS' LIGHTS.

It may be remembered that in 1890, the German Marine Observatory tested some three thousand running lights in use on board ships, and found two-thirds of them defective. Further tests of the visibility of lights of known candle-power were made by the German Committee last year, and some of the results obtained are noted in a leaflet just distributed to seamen by the U.S. Weather Bureau. The law of emission for a white light is that its visibility is proportional to the square root of its candle-power, and the results of the experiments by the Committee closely follow the law, the departures being no greater than the estimated errors of position of the vessel. The mean of a large number of observations gave as the distance at which a white light of one candle-power became visible 1·40 miles for a dark clear night, and 1·00 mile for a rainy one. Experiments undertaken in America, after the International Maritime Congress in 1889, gave the following results in very clear weather: A light of 1 candle-power was plainly visible at 1 nautical mile, and one of 3 candle-power at 2 miles. A 10 candle-power light was visible with an ordinary binocular at 4 miles; one of 29 candles faintly at 5, and one of 33 candles visible without difficulty at the same distance. On a second evening, exceptionally clear, a white light of 3·2 candle-power could readily be distinguished at 3, one of 5·6 at 4, and one of 17·2 at 5 miles. The Dutch governmental experiments, conducted at Amsterdam, gave the following results: A light of 1 candle-power was visible at 1 nautical mile; 3·5 at 2, and 16 at 5 miles. Experiments with green lights gave 0·80 as the distance in miles at which a green light of a single candle-power is just visible. The candle-power required for a green light to be visible at 1, 2, 3, and 4 nautical miles was 2, 15, 51, and 106, respectively. The American experiments before referred to give for green light: 3·2 candle-power fairly visible at 1 mile, and 28·5 clearly at 2 miles, these results being, however, from a limited number of experiments. The German trials were much more numerous. The extraordinarily rapid diminution of the visibility of the green light with the distance, even in good observing weather, and the still more rapid decrease in rainy weather of a character which will but slightly diminish the intensity of a white light, show that it is of the utmost importance to select for the glass a shade of colour which will interfere with the intensity of the light as little as possible. The shade recommended is a clear blue-green. Yellow-green and grass-green should not be employed, as they become indistinguishable from white at a very short distance. For the red, a considerably wider range is allowable, but a coppery-red is said to be the best.

THE RELATIVE POWERS OF LARGE AND SMALL TELESCOPES IN SHOWING PLANETARY DETAIL.

It is to be hoped that a definite understanding will soon be arrived at regarding the differences between large and small telescopes in revealing delicate surface-markings on Mars, Jupiter, and Saturn. The subject of relative efficiency was discussed about ten years ago, and some interesting evidence was evoked as to the different forms and sizes of telescopes, but no settlement of the question was possible in the face of the diversity of opinion existing. The time seems to have come when the subject may be suitably referred to, and the facts considered apart from mere prejudice or preference for any kind or size of instrument.

The phenomenal results recently claimed for certain small telescopes are almost of a character to shake even the faith of those disposed to acknowledge their great utility on several classes of objects, for our confidence cannot go beyond reasonable limits. In individual cases a good though small instrument, an acute well-trained eye, acting in combination with the best atmospheric conditions, will yield surprising results; but some of those lately published border upon romance, and henceforth it would seem that if all the data derived with such means are to be absolutely accepted, then large telescopes are grossly incapable on certain important objects, and may as well be packed away in the lumber rooms of our observatories.

This is the more surprising when we consider the opinions expressed during the discussion which previously took place on the same subject. Prof. C. A. Young, who has charge of the 23-inch refractor at Princeton, said: "I can almost always see with the 23-inch everything I see with the 9½-inch under the same atmospheric conditions, and see it better—if the seeing is bad only a little better, if good immensely better." Other observers having the means of comparing large and small instruments, side by side, furnished similar evidence, except in the case of M. Wolf, of Paris, who said: "I have observed a great deal with two instruments (both reflectors) of 15·7 and 47·2 inches aperture. I have rarely found any advantage in using the larger one when the object was sufficiently luminous." Prof. Asaph Hall, whose

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